

Toward Long-Term Persuasion Using a Personified Agent

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Abstract. People sometimes treat a nonliving object including a computer as if it is a living one. Today, we can interact with them regardless of location or time and we are sometimes affected by computers to decide something. Thus, strategies for weaving virtual experience generated by a computer into the real world are needed because of the prevalence of computers compared to the past. However, a room for discussion is still exist in an aspect of relationship between motivation for specific behavior and representation of information related to the behavior. In this paper, we discuss the design implications for choosing a virtual agent representing a personified object for long-term persuasion. Based on the previous experiments, we conducted a group study regarding design aspects of a personified agent. We describe the details and findings of group study; and then discuss design implications and future directions for personified agents which can construct preferable relationship with a user.

1 Introduction

People sometimes treat a nonliving object as if it is a living one. Reeves and Nass stated that people sometimes interact with computers as if they are living things [10]. When people treat computers as a living entity, they are conscious that computers are lifeless; however, they still communicate with computers socially [5]. As another example, an automated sweeper is reported to be seen as a “cute thing” as if it is a companion animal [8].

Computers are so prevalent that we can interact with them regardless of location or time. In addition, we are sometimes affected by computers to decide something. For example, computer products support our daily exercising using technologies (e.g. Nike+¹), or websites encourage visitors to buy products using techniques such as recommendation. Fogg defined persuasion as “an attempt to change attitudes or behaviors or both” [3] and proposed Captology (Computers as Persuasive Technologies) as related realms, for example, designing, analyzing or understanding persuasive computer products [3].

Thus, strategies for weaving virtual experience generated by a computer into the real world are needed because of the prevalence of computers compared to the past. For example, in the Human-Agent Interaction (HAI) field, researchers

¹ https://secure-nikeplus.nike.com/plus/products/#all_day_section.

attempt to discuss interactions between people and general artificial objects not limited to a computer and a robot [15]. Captology covers persuasive computer systems and points out roles of computers as a persuader [3]. Although Captology and HAI are different research field, both are related to interaction between artificial objects and users affecting them sometimes.

Computers can behave as social entity in persuasion as well. Multiple forms of a social behavior can be considered for persuasive computer systems. For example, social entity can be expressed as text messages or speech-based assistant like Apple Siri². As another way, computers can also present embodied character to a user.

Still, people can be familiar with daily things represented as a character. The authors examined an agent as a personified object shown to a user and discussed the possibility of persuasion by such agent in the previous study [17]. In this study, we designed a “cleaning” task and then ask participants to move objects to the initial locations. This task incorporated a prototype application and this application show an agent as a personified object. Using this setting, the agents can interact with a user as if an object itself is directly talking to the user [17]. The future direction of this study included the possibility of encouraging users to be interested in real-world problems by receiving messages from an agent as a “proxy” of an object.

However, a room for discussion still exists in an aspect of relationship between motivation for specific behavior and representation of information related to the behavior. Positive impressions of an agent can lead to encouraging users to be interested in the agent and real-world problems such as beautification of public spaces or environmental problems. Moreover, sustained motivation leads to the possibility of long-term intervention by persuasive computer systems in a daily life.

In this paper, we discuss the design implications for choosing a virtual agent representing a personified object for long-term persuasion. Based on the previous experiments, we conducted a group study regarding design aspects of a personified agent. We describe the details and findings of group study; and then discuss design implications and future directions for personified agents which can construct preferable relationship with a user. We use the word “personification” when an agent behaves as a “proxy” of a daily object. Although we sometimes intend a meaning similar to “anthropomorphism”, we also intend the broader representation of an object than human-like things.

2 Related Work

Design of personified artificial objects has been discussed by researchers from the past. Owada pointed that people treat a Roomba produced by iRobot³ as if it is a living thing and he discussed personification required for electrical appliances in the future [8]. In his book, he mentioned Media Equation proposed by Nass and

² <http://www.apple.com/ios/siri/>.

³ <http://www.irobot.com/For-the-Home/Vacuum-Cleaning/Roomba.aspx>.

Reeves [10] and explain that people sometimes interact with nonliving things as if they are living ones. Besides, he introduces organic and sympathetic natures of an object referring to related work [8]. Personification has the possibility of emotional attachment to an object. For example, affection for personified daily objects is mentioned in [14] with some examples.

Yamada et al. stated that the degree of reality should not exceed the level of functions for the successful design of personification [14]. They called the difference between functions modeled by a user and actual ones as Adaptation Gap [14]. This aspect corresponds to the discussion by Shedroff and Noessel. They explained that if an application provides a user of excessive expectation compared to actual functionality, the user can be annoyed [12]. They mentioned to Knowledge Navigator which was created by Apple in 1987 and explained that the agent deployed in Knowledge Navigator worked because of its suitability for the actual ability [12]. Conversely, they also pointed out an example of an unsuccessful assistant agent drawing the story of Clippy deployed in Microsoft Office [12].

Although discussions of the effectiveness of embodiment exist from the past, the possibilities of an embodied agent are suggested. For example, Lester et al. applied animated agent to an interactive learning environment [4]. Their work suggested that the existence of an animated agent had positive effect on perception of learning experience in an interactive learning environment (persona effect) [4]. DiSalvo and Gemperle discussed applying anthropomorphism to product design. In their work, two types of quality of anthropomorphism: “seduction” and “fulfillment” [2]. Seduction means that a product leads people to consume it by anthropomorphism and fulfillment leads to meaningful understanding of the product. Seduction can still be accepted because of enjoyable and rewarding nature [2].

Moreover, researchers are trying to examine essential elements for anthropomorphism. Osawa et al. attempted to anthropomorphize a daily object by attaching eyes-like and arms-like parts to it [7]. They examined reaction of a user when s/he received an explanation of functions of a printer from different object. One is a printer with eyes and arms and the other is an independent robot. As a result, they reported that a user more concentrated to the target and remembered the functions explained [7].

3 Previous Studies

We used a prototype application named Fairy Agent [16]. This prototype can show a 3D virtual character superimposed on an object using augmented reality. Each character was intended to behave as a personified object and interact with a user as if the object itself has obtained life [17]. We examined combinations of objects and characters using questionnaires and a task based study.

We chose appearances of the agents using keywords associated with each object. Especially, we focused on keywords related to an occupation and then we prepared existing 3D models which can be associated with the keywords.

Keywords were collected in the Object-Image questionnaire; and then, agents were chosen referring to the results of the Object-Image questionnaire in the Agent-Image questionnaire. Based on the results of questionnaires, we experimented with Fairy Agent to examine the perception of personification and the effect of persuasion.

From the results of each surveys, the condition where different agents chosen for each object were shown on near the objects suggested the possibility of persuasion using a personified agent [17]. In this case, we have chosen an agent based on keywords associated with an object regardless of the preference of a user. However, the consideration of an impression of an agent can still be needed if the agent tries to construct relationship with a user.

4 Group Work

We arranged a group work to collect ideas for personification regarding the preference of users. The main purpose of this group work was to specify essences of personification of nonliving objects referring to existing pop cultures such as games and anime. The group work was divided into two parts and each part is followed by a sharing and discussion session (Fig. 1). This kind of findings can be utilized for designing personified agent.

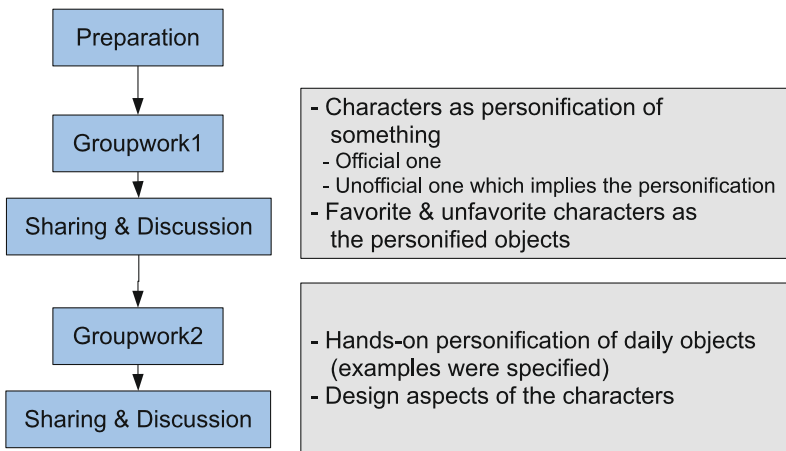


Fig. 1. Group work flow

4.1 Participants

Ten participants from our laboratory attended the group work. The participants consist of seven males and three females; and all participants were Japanese. Participants of previous studies [17] were included. They are paired with another participant and then each participant is supposed to discuss themes with the partner.

4.2 Task 1: Essence of Personification

In the first part, we discussed the main features of personified (anthropomorphized) characters referring to existing examples. We asked participants to consider characters which they know and then find the favorite or not-favorite points of them. Especially, we asked each participant to enumerate existing personified characters from multiple aspects: official ones, not-official ones, favorite ones, and not-favorite ones. Then, participants were asked to discuss the main elements for personification and favorite/not-favorite attributes of the characters.

We separated official and not-official characters because an official character may not always suitable for an original object to which was referred by the character.

4.3 Task 2: Personification of Familiar Daily Objects

We have chosen two daily objects: a camera tripod and a box of tissue paper. We asked participants to choose one or both of them and designing personified characters and its personalities. When proceed with the task, participants can choose one of two options: generate a 3D model using SIMS3⁴ or sketch an image of the personified agent. However, the number of the vacancy was limited for the SIMS3 option, most of participants

Before the task, we announced example aspects to the participants: genders, ages, hair style, clothes and accessories. Also, other types of an aspect can be accepted.

Tables 1 and 2 show a part of keywords answered by participants. Keywords from a part of participants could not collected clearly. Some participants designed a character of both a box of tissue paper and a camera tripod; however, the others designed for either of them. Each keyword was translated to English while the original words were specified in Japanese. The “-” means that difficulty was existed in extracting keywords clearly.

5 Findings and Discussions

We extracted clues regarding preferences and perception of personification in the Task1. In addition, we asked participants to explain the process of personification of the daily objects in the Task2. The Table 3 shows the sentences extracted from the discussion in the Task1 and new aspect of personification in the Task2.

Table 1. Keywords of a character for a box of tissue paper

Participant	Color	Clothes/Accessory	Hairstyle	Gender	Other characteristic
P1	White	White coat	Longish	Male	-
P2	White	Red ribbon, dress	Long	Female	Caught a cold
P3	White	Dress	Long, fluffy	Female	-
P4	White	-	Curled brown hair	-	-

⁴ <http://www.thesims3.com>.

Table 2. Keywords of a character for a camera tripod

Participant	Color	Clothes/Accessory	Hairstyle	Gender	Other characteristic
P3	Black	T-shirt, glasses, wrist band	Short	Male	Supports a camera (personified camera character is implied)
P5	-	Square-like cap, belt	Short/ponytail, with a fluffy tip	Male	Loyal to a camera person
P6	Black	Cap	Ponytail	Female	-
P7	Black	Glasses	-	Male	-

Table 3. Extracted sentences of attributes for personification from the group work

Task	Subject	Keywords
Task1	Personification	Resemblance to, or consistency with an original entity
	Preference	Unreal abilities, effect of learning, desire, commonness
Task2	Considered aspects	Functions, an attribute of a user, specific situations

5.1 Task1

Resemblance to, or consistency with an original entity to which a personified agent refers includes contexts or episodes around the entity. That is, “effective personification” can be derived from natural translation of, for example, an original image, a history, and uniqueness. In an aspect of preferences, an agent’s fictional nature can be important characteristics. For example, if an ability of an agent matches the desire of a user or commonness between the agent and the user, the user can be attracted to the agent. Existing work suggest that people prefers a computer whose personality is similar to them [6]. When a characters from pop cultures concern, a certain amount of unreality can be accepted.

Certain amount of incompleteness can be accepted with affection [8]. Owada discussed combination of the scenario of a character and an electric appliance (iRobot Roomba). Roomba sometimes sweeps a room in a less sophisticated manner and this can be incompleteness [8]. He pointed the similarity of a hero/heroine of a story and the behavior of Roomba [8].

5.2 Task2

Keywords related to a color for each daily object were almost same. This commonness was considered to be affected by a color of a daily object. Clothes, accessories, and hairstyle had a partial commonness and some of them are related to texture of an object.

From the keywords from the Task2, we find interesting keywords for personification process. For example, one participant mentioned a function of a tripod. The personified character can have a camera as a friend because a tripod supports a camera. As another example, another participant said that a personified character, which derived from a box of tissue paper, catches a cold because of an image of those who blow their nose.

As another result, some participants specified characteristics depend on a model object or particular use. For example, one participant introduced red color for an agent of a box of tissue paper because she associated tissue paper with nosebleed. Thus, keywords can be derived from specific situations.

5.3 Summary

In summary, we propose key implications for designing agent characters as a personified object. First, user’s preferences have the possibility of being adjusted by drawing fictional settings. Second, different types of keywords can be utilized for designing agent. That is, an agent derived from keywords according to common understandings and image of a model object can be easily understood. In contrast, certain amount of “accents” can also be introduced to make an agent interesting.

When long-term persuasion using personified agent is considered, positive impression and attractiveness of an agent can play a role. Balancing between consistency with the original and fictionality should be introduced.

6 Future Direction

In this paper, we mentioned the possibility of long-term persuasion using interaction with personified agent and existing pop culture. Especially, an agent can be embodied form and it can be combined with existing fictional stories or worldview; therefore, an application can provide users of the extended experience during the use. In addition, if an application let users choose their favorite agent for a companion, they can be affected by the agent because of their preference. We call such agents as customizable personified agents.

However, when a developer try to apply the customizable personified agent to general persuasive application, the customizable personified agent needs to be combined with other persuasive methods because of multiple issues. We have proposed the Tailorable Persuasive Agent (TPA) framework, a conceptual framework for development of a persuasive application with an agent for a long-term period. TPA consists of three elements: Adaptive Persuasion (AP), Intention Adjustment (IA), Preference-Based Internalization (PBI).

Adaptive Persuasion (AP). This element is related to variable persuasion based on estimated behavior status of a user. We can use existing theories for modeling of individual current behaviors. As one of behavior models, we referred to Transtheoretical model proposed by Prochaska et al. [9] as a staged behavior change process.

Intention Adjustment (IA). An application can adjust expectations by users to actual abilities of an agent and encourage users to continue to use the application. This element is described in two aspects.

Augmenting use intentions. For example, an application can let a user stop interaction with an agent preventing annoyance [12]. As Henriette et al. examined [13], visual appearances can be chosen to reduce disappointment by users.

Encouraging interest in persuasion. Agent properties can be arranged to encourage a user to take persuasion seriously. For example, Zambaka et al. compared different characters in different gender, species, and reality [18]. According to their experiment, people tend to be persuaded by a person in different genders (male/female). In addition, nonhuman characters were seen more bold than real human ones [18].

Preference-Based Internalization (PBI). This element contains virtual experiences provided by customizable features from an application. The customizable personified agent is included in this element. Using the customizable personified agent, application can attempt to prevent users from ceasing behavior change if they are bored in the needed task. This functionality is intended to trigger intrinsic motivation. Intrinsic motivation is caused by enjoyment and challenge while extrinsic motivation is outcome-oriented, and provided by external pressures and rewards [11].

TPA is intended to be utilized across modeled time frames from the beginning of application use to being accepted and continued use. Figure 2 shows an overview of the TPA framework.

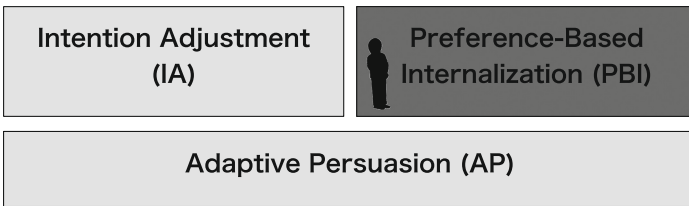


Fig. 2. Conceptual framework

Although different combinations of elements are used for each time frame, the AP element is fundamental part of persuasive application and this element is applied during most of the use period.

7 Other Issues

In relation to the proposed framework, some aspects are yet to be discussed. The perception of personification and embodiment can be varied among cultures. When people are familiar with embodied personification because of fictional stories, we may able to accept the personification. However, embodiment is not required for personification [14] and developer can choose a design among multiple options.

If a persuasive application is intended to be internationalized, the preference of attributes for designing agents should be discussed from a multiple-culture or

multiple-generation aspect. For example, a game character on a package design is known to be changed suitable for a country in which the game is sold [1]. A visual or nonvisual attributes for a virtual agent should be adjusted according to countries or districts where the persuasive agent is used.

8 Conclusion

In this paper, we explained the room for discussion of persuasive agent in an aspect of personification and introducing existing pop cultures. Based on the previous experiments, we described a group study consists of two parts. In the first task, we attempted to extract characteristics of personified agents referring to existing characters. Then, we examined attributes of viewpoints of designing personified agent through the hands-on task.

Based on the findings from the group work, we discussed design implications and future directions for personified agents which can construct preferable relationship with a user. As a summary of the group work, we proposed two implications. First, user's preferences have the possibility of being adjusted by drawing fictional settings. Second, keywords for designing agent must be carefully chosen according to common understandings of image of a model object.

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